### Becquerel's and Lippmann's Colour Photographs.

The point raised by Prof. Meldola (p. 28) is partially, if not completely, answered by Otto Wiener in a most valuable paper, "Ueber Farbenphotographie durch Körperfarben, und Mechanische Farbenanpassung in der Natur," published in *Wiedemann's Annalen*, 1895, lv. 225–281. Wiener devised a method of examining colour photographs through a right-angled prism in such a way that pigment colours, which owe their hues to absorption, are distinguished from interference colours by not changing their positions when seen through the prism. The application of this method to colour photographs by Lippmann's process and the older processes of Seebeck, Poitevin and Becquerel, shows that in Lippmann's photographs the colours are due entirely to interference. In Becquerel's process they are due mainly to interference, though pigment colours are formed to an extent which is generally very small, but which increases with the duration of the exposure. The colours on Becquerel plates *do* change with the angle of incidence, though the changes are very small, probably in consequence of the high refractive power of the film. Further, when the film is examined from the back the colours do not occupy the same positions as when they are viewed from the front. It follows that the colours on Becquerel plates are due essentially to the same cause as those on Lippmann's plates, and the theory of standing waves is applicable in both cases.

With the processes of Seebeck and of Poitevin, on the other hand, the colours are exclusively pigment colours, and the theory of standing waves is not applicable.

Weston-super-Mare, May 16. C. H. Bothamley.

### Influence of Terrestrial Disturbances on the Growth of Trees.

In reply to the note of Mr. H. J. Colbourn on "Influences of Terrestrial Disturbances on the Growth of Trees," in your issue of April 23, allow me to say that his ingenious suggestion of connecting a zone of narrow rings in a section of Douglas spruce with some supposed terrestrial disturbances occurring about the same time, is hardly tenable, even if the coincidence of the two phenomena were established, which seems not to be the case. The occurrence of a zone of narrow rings is common in all our trees, and I have observed it most frequently in all southern pitch pines, which are rarely over three hundred years old, and hence outside of the possibilities of the influence of unknown or uncertain terrestrial disturbances.

The suddenness with which the rings become narrow and then again wide, described by Mr. Colbourn, and observed by us in many other trees, is, to be sure, puzzling; nevertheless, we cannot escape the conclusion that it is due to changes in the conditions surrounding the tree. Yet it is not necessary that the change of conditions and of ring-width should be simultaneous, that is to say, the change of conditions may have occurred without having been immediately responded to by the growth of the tree.

The following explanation may serve as a type. Let a tree grow up under favourable conditions for a hundred years, as the Douglas spruce in question seems to have done, when its ring-growth will be wide, its crown reaching above its neighbours. A hurricane breaks off a large part of its crown, when necessarily and suddenly, at least within a year, the rings become narrow in proportion. Within the next thirty years the crown recuperates, which in a resinous conifer like the Douglas spruce is possible without fear of fungus attacks and decay; but the food-material descending from the foliage will for a long time be only sufficient, on the particular section in question at the base of the tree, to make the narrow annual ring, even after the crown is fully recuperated. Were a section cut higher up in the tree, it would be found that the rings there have begun to widen sooner than at the lower section. Finally, and rather suddenly for any given section, the supply has become normal, and especially if an exceedingly favourable season occurs at the same time the rings show again normal width.

The same sudden change from narrow to wide rings is observed when a tree oppressed by its neighbours is suddenly relieved by windfall or by man's interference from its oppressors; but the response even then is not simultaneous, it takes one or more years before the crown is in condition to utilise the full amount of light at its disposal, and to furnish food to all parts of the tree in increased ratio. B. E. Fernow.

Washington, D.C., May 11.

### Our Bishops and Science.

The friends of both science and religion will thank you warmly for publishing the Bishop of Ripon's public testimony to Huxley's spirit of sincerity and love of truth. It is the more timely because of your recent strictures upon the Bishop of London. May I therefore, as a country parson, with an equal love for scientific integrity and religious truth, suggest to the readers of those strictures in Nature (p. 607, April 30) that probably Bishop Temple has been misunderstood. I am sure it is not fair to his spirit to put into his mouth, "Away with all these abominations. Purge the elementary schools of everything scientific, and substitute dogmas and subjects more fitted to the stations of life in which it has pleased God to call the scholars."

Is it not more likely that the real clue is in the sentence quoted about "instructing little children in *elementary* schools in *a great many scientific subjects?*" For many earnest educationalists have, as friends of science, spoken strongly on the evils of the cramming of bits of science subjects and "stages" by crudely crammed "Government certificated" "science" teachers cramming large classes for grants on "passes" to butter their bread.

In any case, the true views of the great bishop will be found in his "Bampton Lectures" for 1884, on the relations between science and religion; and the last *Quarterly Review*, on G. J. Romanes, contains an eminent example of the reverent treatment of both.

I will frankly add that I do not think your quotations from Mr. Mundella's address can be too widely known among the bishops and clergy who have such influence with the laity. Agricultural pursuits suffer more from our ignorance than our want of money; and agricultural science cannot be widely taught until the elementary principles of chemistry and physics are diffused in our villages.

On this subject we have also had the weighty testimony of Mr. Gladstone. The voting of money for light railways and such objects is a quack remedy. The fact is that true educational enthusiasts who will think first of our children, and be generous to them *first*, have hitherto been appallingly scarce in the House of Commons and its parties.

Nor is even the *geographical* significance of our need of science education likely to be perceived by the majority, if, as is stated in the *Anti-Slavery Reporter* (March–April 1896, p. 80), two M.P.s can stand before a map of South America in the map room of the House of Commons, and dispute with one another as to where Egypt was to be found on that map. However matters are mending, we hope. J. F. Heyes.

Crowell, Oxon, May 15.

### Blood-Brotherhood.

There are good reasons why this ancient custom can never be a preventive of disease, though sometimes it may be a cause of it. The serum treatment has been found useful, and presumably will be found useful only in such diseases or diseased conditions as are due to poisons (toxins) secreted by various species of pathogenic micro-organisms (*e.g.* those of rabies, anthrax, diphtheria), or by some animals (*e.g.* scorpion, snake), as weapons of offence or defence.

As regards certain zymotic diseases (*e.g.* small-pox, scarlatina, syphilis), it is known that one attack confers more or less complete immunity against subsequent attacks; that is, the micro-organisms of these diseases are, after the recovery of the host, unable to persist and produce their toxins in him; and this for the reason that during his illness certain of his body cells, known as phagocytes, become inured to the toxins, and are thus enabled to attack and destroy the micro-organisms producing them. When the phagocytes fail to become inured, the micro-organisms continue to produce these toxins, and the host perishes, poisoned by them. Now the toxins produced by the micro-organisms of most zymotic diseases are not always of the same degree of virulence, and when they are feeble the phagocytes the more easily become inured to them, and destroy the micro-organisms; and not only do they do so, but this preliminary training enables them, when attacked by more virulent micro-organisms of the same species, *i.e.* of the same disease, to react to the stronger toxins of these also, and again destroy the micro-organisms. Man has taken advantage of this fact to artificially lower or "attenuate" the virulence of various species of pathogenic micro-organisms (*e.g.* those of anthrax an

© 1896 Nature Publishing Group

cholera); and inoculation with them or their toxins inures the individual so treated to resist the attacks of micro-organisms of the same species and of the normal degree of virulence. One way of attenuating or rendering less virulent the toxins is to inject them into an animal that does not easily perish of them (*e.g.* horse, as regards diphtheria), when they undergo partial intracellular digestion within his tissues. His blood serum then contains altered toxins (the so-called anti-toxins), experience of which inures the cells of an animal of a more susceptible species (*e.g.* man) to resist the attack of virulent micro-organisms with unaltered toxins. It is noteworthy that when toxins and anti-toxins are mixed the latter may inure the cells to the former before death occurs, for the reason that these do not under normal conditions cause immediate death. For this reason animals are able to withstand much more than a fatal dose of a toxin when it is mixed with the appropriate anti-toxin, and sometimes even to recover from a disease which would otherwise be fatal if during the course of it the anti-toxin is injected. But toxins and anti-toxins are not retained within the system. They are digested by the cells and excreted, and therefore enduring immunity is not conferred by their presence, but by the fact (in some diseases at least) that when the cells are once inured they remain so.

It is clear that the serum treatment can be useful only in diseases against which immunity may be acquired, if only for a short time. In other diseases (*e.g.* tuberculosis, malaria, leprosy) against which immunity cannot be acquired, which do not run a pretty definite course of limited duration, of which one attack does not protect against subsequent attacks, it is useless; for here training does not benefit the cells, or if in some cases it does benefit them, this benefit is of such limited duration as to be practically useless.

After this, from want of space, very dogmatic statement of the rationale of serum-therapeutics, let us inquire what may be hoped from the ceremony of blood-brotherhood in its medical aspects. Clearly nothing. It will not, of course, endow the traveller with his blood-brother's powers of resisting hardship (heat, cold, hunger, &c.); it will not confer immunity or increased powers of resistance against that class (the most death-dealing class) of diseases against which immunity *cannot* be acquired; and lastly, it will not confer immunity or increased powers of resistance against that class of diseases against which immunity *can* be acquired, unless there is present in the blood-brother this or that micro-organism in an attenuated form, or unless antitoxins are present in him to an inconceivable degree of concentration—very remote possibilities, or rather impossibilities, on which the traveller were wise not to count. On the other hand the blood-brother may communicate actual virulent disease, for instance syphilis and malaria.

G. Archdall Reid.

### Remarkable Sounds.

In a Japanese work, "Hokuetsu Kidan," by Tachibana no Mochiyo (published *circa* 1800, tom. ii., fol. 5, *seqq.*), I have found some remarkable sounds described. Among the details given therein of the "Seven Marvels of the Province of Echigo," we read: "The fifth marvel, the Dônari [literally *Body Sounds*, or *Temple Sounds*], is a noise certain to be heard in the autumnal days, just before a fine weather turns to stormy, it being sounded as if the thunder falls from the cloud, or the snow slides down a mountain. Where it originates is quite uncertain, as there are in the counties several mountains assigned therefor. The sounds are heard of same intensity in variously distant places." Further, the author recites a folk-tale current in his time among the villagers of Kurotori, in Co. Kambara, which attributes these sounds to the head and body of a hero, Kurotori Hyôe [killed in 1062?]; separately interred under a Shintoist temple in this village, they ever strive to unite once more. "The marvel, it is said, is now seldom met with; still it occurs frequently within two or three miles of the village, proceeding doubtless from the precinct of the temple. And the fact is more wonderful that the inhabitants of Kurotori themselves never hear the sounds unless they go out of the village." Concluding the narrative, the author, from his personal observation, argues the action of the tide-waves upon the earth to be the real cause of these curious sounds.

May 18. Kumagusu Minakata.

## BOSNIA-HERZEGOVINA AND DALMATIA.

THE progress of prehistoric archæology, the youngest of the inductive sciences, is one of the more important facts in the history of the intellectual development of the latter half of the nineteenth century. Up to 1870, attention was chiefly directed to the antiquity of man and his place in the geological record, and to the classification of his advance in the Neolithic, Bronze, and Iron ages in Europe. Man was proved to have lived in a remote past, not to be measured by years and under climatal and geographical conditions totally different to those now met with in Europe. The next ten years were chiefly spent in elaborating the details as to the range of Palæolithic man, and in working out the sequence of events, separating the Pleistocene period from the dawn of history. The Neolithic, Bronze, and Prehistoric Iron ages of human progress were traced far and wide over nearly the whole of the old and the greater part of the new worlds. In the last decade the centre of archæological interest has shifted slowly in the direction of the frontier of history. On the one hand the researches of Flinders Petrie have revealed the close connection of ancient Egypt with the nations of the Mediterranean long before the rise of the Greeks, and have rendered it possible for us to use the Egyptian chronology as the standard to fix the date of prehistoric events in Southern Europe and in Asia Minor. On the other, in these latter areas, many workers, among whom Schliemann stands foremost, have revealed the manners and customs, the daily life, the modes of warfare, the habitations, fortresses and tombs of the very peoples who were in touch with Egypt. We even know, thanks to Arthur Evans, that there was a system of writing in the Ægean area long before the introduction of the Phœnician alphabet, and we may look forward to his future researches to make it intelligible.

A valuable book[1] on Bosnia-Herzegovina and Dalmatia is the last contribution to the subject. Under the modest title of "Rambles and Studies," it might very well be taken for the usual book of travels in a land of wonderful beauty, till now practically closed to the ordinary traveller. Under the Austro-Hungarian dominion, now some twenty years old, good roads have replaced the old tracks, and law and order reign instead of the brigandage of the past. New lines of railway and of steamers connect the chief centres, manufactures are encouraged, and schools for the education of both Christian and Moslem are in full swing. There are luxurious hotels in place of the old caravanserais, and the records of the past are being carefully preserved in museums, under the charge of competent scientific men, instead of being ruthlessly destroyed, as they were under the old *régime*. There are snow-covered mountains, great rivers and waterfalls, like those at Ottawa, and lakes embosomed in trees. There are ravines, like those of Miller's Dale, only larger, and caverns, and all the characteristic scenery of the limestone forms the surface of the country. The interest, however, chiefly centres in the inhabitants. The present phase of transition from Eastern to Western ideas is of special value at this time, when the cry of oppressed lands is ringing in the ears of the Western nations, because it shows with what extraordinary rapidity a people ground down to the dust for centuries by the Turk, may become happy and prosperous under a good system of local self-government. What the Austro-Hungarians have done in the Bosnia-Herzegovina, may be done by the Powers in Asia Minor and in the islands of the Ægean Sea. From this point of view Dr. Munro's well-written book is worthy of the attention of our rulers. Dr. Munro has dealt with all these things with a light and pleasant

---

[1] "Rambles and Studies in Bosnia-Herzegovina and Dalmatia." By Robert Munro, M.A., M.D., F.R.S.E. 8vo. (Blackwood, 1895.)

© 1896 Nature Publishing Group